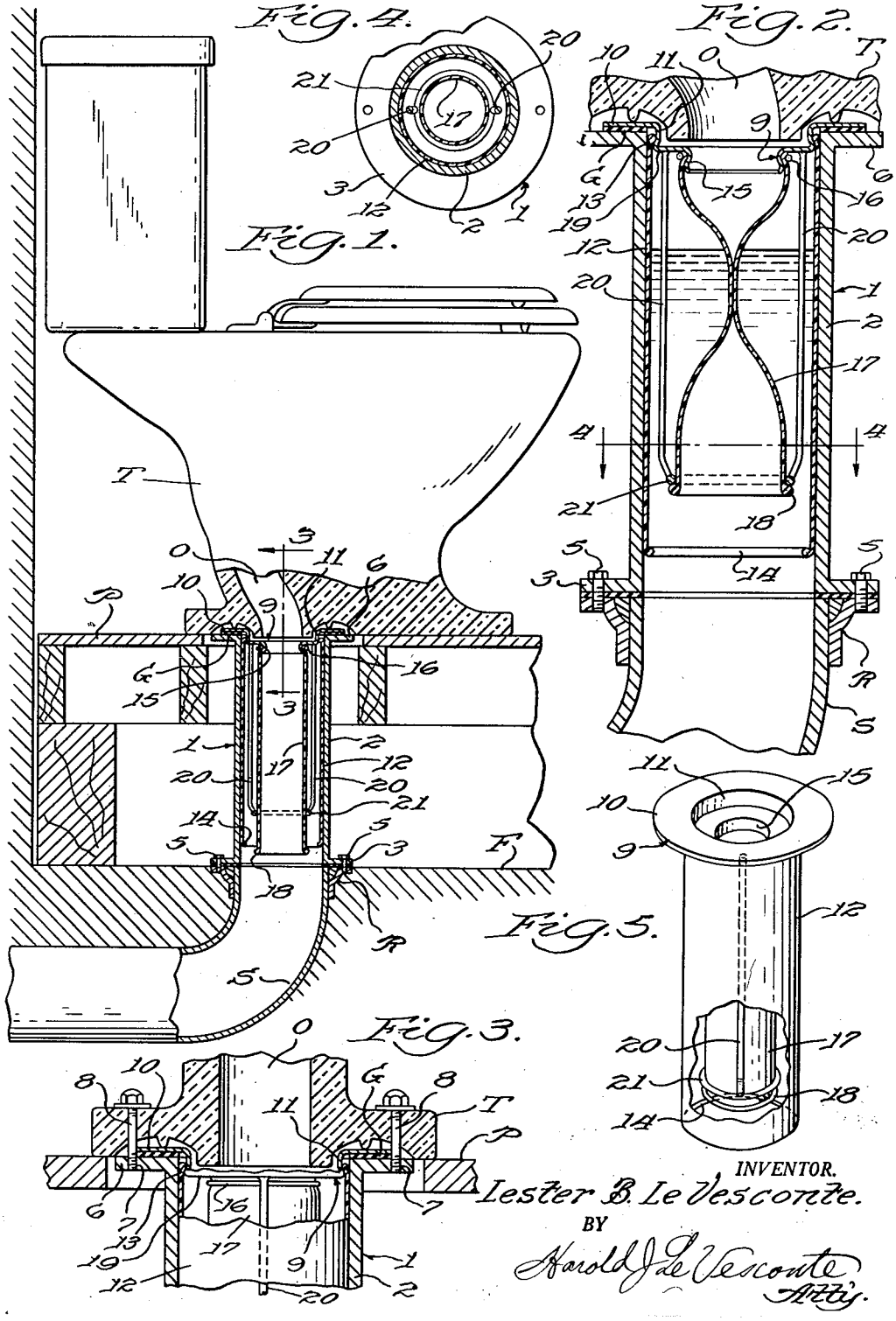
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BACKFLOW PREVENTING MEANS FOR RECEPTOR CONNECTED ENDS OF SOIL PIPES

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BACKFLOW PREVENTING MEANS FOR RECEPTOR CONNECTED ENDS OF SOIL PIPES

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This invention relates to backflow preventing means and more particularly to a device effective to prevent backflow from a sewer through a toilet connected thereto.

In many locations it is desirable to locate a toilet in the basement of a house but the possibility of so doing is prohibited by consideration of the fact that storm conditions and the like may at times cause the sewer to back up even though under normal conditions there is sufficient fall to permit normal use of the toilet. The problem of providing a proper backflow preventing means for such use involves meeting the following necessary requirements:

1. It must not offer any obstruction to normal operation of the toilet.

2. It must not have any edges, crevices or corners on or in which particles can collect.

3. It must close automatically in the presence of a backflow condition.

4. It must resist a backflow pressure of at least 5 p. s. i.

5. It must open to normal use automatically when a backflow condition ceases.

6. It must have long life and resist corrosion in the presence of moist sewer gas.

7. It must be economical to manufacture and be capable of installation by the usual craftsmen.

With these and other considerations in mind, it is an object of the present invention to provide a backflow preventing means adapted to be installed between a toilet and the soil pipe which normally offers no obstruction to the normal passage or discharge from the toilet to the soil pipe but which upon reverse flow conditions will shut off such flow and thus effectually prevent backflow conditions to occur.

Another object of the invention is to provide a backflow preventing device of the above character which in addition to its backflow preventing action is automatically restored to operative condition upon cessation of the backflow condition.

A further object of the invention is to provide a toilet backflow preventing device which is capable of installation between a toilet and the soil pipe with modification of either the toilet or soil pipe.

Still another object of the invention is to provide a device in which the foregoing objectives are realized in practice, which is simple in construction and economical to manufacture, is formed of materials not subject to deterioration over long periods of use, and which is reliable for its intended purpose.

With the foregoing objects in view, together with such additional objects and advantages as may subsequently appear, the invention resides in the parts, and in the construction, combination and arrangement of parts described, by way of example, in the following specification of a presently preferred embodiment of the invention; reference being had to the accompanying drawings which form a part of said specification and in which drawings:

Fig. 1 is a side elevation of a toilet and the connection

thereof to a soil pipe by a device embodying the present invention, the device being shown in medial section together with the adjacent portions of the soil pipe and toilet, the device being shown in flow permitting position,

Fig. 2 is an enlarged scale view similar to the sectioned portion of Fig. 1 showing the device in flow preventing position,

Fig. 3 is an enlarged scale, fragmentary, sectional view taken on the line 3—3 of Fig. 1,

Fig. 4 is a reduced scale sectional view taken on the line 4—4 of Fig. 2, and

Fig. 5 is a top perspective view of the assembled elements contained within the casing of the device; a portion of the wall being broken away to show interior construction.

Referring to the drawings, Fig. 1 shows a toilet T fixed to a platform P resting on a floor F and connected to a soil pipe S having a toilet ring R fixed thereto by the tubular casing 1 of the device embodying the invention. The device might be as well connected to the soil pipe below the floor level providing that the soil pipe was initially located a sufficient distance below the basement floor, but since the device will find its greatest usefulness in connection with the installation of toilets in existing floor and soil pipe installations, it is so illustrated. The casing 1 is formed of suitable metal and comprises a tubular body 2 of the same internal diameter as the soil pipe and at its lower end is provided with a flange 3 by which it is connected to the toilet ring R by bolts 5 extending through the flange and engaging the slots or bolt receiving holes in the flange of the toilet ring. Attention is called to the fact that the device is intended to be connected to the soil pipe through the use of the conventional toilet ring which is mounted on the end of the soil pipe by the usual lead caulking. The upper end of the body 1 is provided with a flange 6 having holes 7 extending therethrough for reception of the bolts 8 by which the toilet outlet orifice O is secured thereto with the usual interposed gasket G between the depending annular rib on the toilet and the flange 6. The height of the platform is such that the upper surface thereof permits the forward end of the toilet to rest thereon when the toilet is thus connected to the flange 6 of the device.

Mounted within the upper end of the casing 1 is a thimble comprising a stepped sleeve 9 formed of thin, corrosion resistant material such as stainless steel or bronze or a suitable plastic; said thimble having a flange 10 interposed between the gasket G and the annular, gasket engaging rib on the toilet. Within the casing 1 the thimble 9 has a shoulder portion 11 spaced in close adjacency to the inner diameter to the inner face of the casing 1 and to the outer periphery of which the upper end of a tube element 12 formed of a suitable flexible plastic such as polyethelene is secured by any suitable means such as the wire tie 13. The outer diameter of the tube element 12 closely engages the interior of the casing and the lower end thereof is disposed in close adjacency to the lower end of thte casing 1 and terminates in a reinforcing collar 14 serving to prevent lateral collapse of that end of the tube element. The thimble 9 includes a depending sleeve portion 15 of smaller diameter than the shoulder 11 disposed concentrically thereto and having an inner diameter which is substantially equal to and coaxially aligned with the outlet orifice O of the toilet. Fixed to the exterior of the sleeve 15 by suitable means such as the tie wire 16 is the upper end of a second tube element 17 formed of a flexible plastic material such as polyethelene which extends downwardly therefrom slightly below the lower end of the tube element 12 and terminates in an externally disposed rigid collar portion 18 which may be molded with the tube or may be attached thereto. Since the tube 17 has substantially the same

inner diameter as the orifice O, it can receive the entire output of the toilet without obstruction.

Depending from the end face **19** of the sleeve **9** between the shoulder **11** and the sleeve **15** thereof are a pair of diametrically disposed rods **20, 20** formed of corrosion resistant material; said rods terminating slightly above the lower end of the tube **17** and supporting a stop ring **21** surrounding the tube **17** and overhanging the collar **18** thereon and thus serving to hold the sleeve extended against longitudinal collapse.

The space between the tubes **12** and **17** forms an air chamber closed at its upper end by the engagement of the tubes with the shoulder **11** and sleeve **15** and the end face of the thimble therebetween. Under normal conditions, the device occupies the position shown in Fig. 1 offering no obstruction to the outflow from the toilet. In the event of backflow, the water rising from soil pipe into the device will enter both the tubes **12** and **17** but since the air above the water in the space between the tubes is trapped, it will be compressed and will collapse the tube **17** laterally as shown in Fig. 2 and thus prevent backflow from extending to the toilet; the engagement between the stop ring **21** and bead **18** serving to maintain the tube **17** sufficiently extended. The greater the pressure so exerted, the tighter the seal thus formed becomes. Ordinarily the rise of water thus occasioned will seldom, if ever exceed say, eight or ten feet; equivalent to a pressure of probably not to exceed 5 p. s. i. When the backflow condition ceases, the device is automatically restored to flow permitting condition.

While, by way of example, the invention has been shown as applied to a toilet as the use for which it will be most commonly employed, it will be appreciated that the invention is applicable to other soil pipe or sewer connected articles such as urinals, wash tubs, sinks, and where the existing vertical distance permits, floor drains.

While the above-described embodiment of the invention represents a presently preferred form thereof which realizes the objectives sought to be obtained and meets all of the necessary requirements for a device of that character, it is appreciated that in the light of the foregoing disclosure, changes and modifications will suggest themselves to those skilled in the art. Accordingly, the invention is not to be deemed to be limited to the exact form thereof so disclosed and it will be understood that the invention includes all such changes and modifications in the parts and in the construction, combination and arrangement of parts as shall come within the purview of the appended claims.

I claim:

1. A toilet backflow preventing valve means adapted to be positioned between the discharge orifice of a toilet and a soil pipe, comprising a vertically disposed tubular body member having means at one end for attachment to the soil pipe and other means at the other end for attachment to the toilet fixture including an annular flange having bolt engaging means for the hold down bolts of the toilet fixture, and backflow preventing means within said body member comprising a thimble element provided with an annular flange interposed between the adjacent faces of the of the toilet fixture and said body member flange, an opening extending through said thimble of substantially the same diameter as the discharge orifice of the toilet and disposed in substantial axial alignment therewith, a flexible tube disposed in said body member and having its upper end attached to said thimble with an air tight connection; said tube being in axial alignment with said opening in said thimble and forming a downward extension of said opening terminating slightly above the lower end of said body member, a rigid collar carried by the lower outer surface of said tube, and rigid means carried by said thimble extending downwardly externally of said tube and terminating in a ring surrounding said tube slightly above said collar and engageable with said collar to prevent longiturinal collapse of said tube; the annular space between said tube and said body member serving as an air dome effective in event of backflow conditions to cause lateral collapse of said tube with consequent prevention of backflow through said tube and into the toilet.

2. A toilet backflom preventing valve means comprising a vertically disposed, tubular body member having substantially the same internal diameter as the soil pipe, said member being positioned between and affording conduit connection means between the discharge orifice of a toilet and a soil pipe; a thimble extending across the upper end of said body member and having an opening therethrough of substantially the size of and disposed in substantially axial alignment with the toilet discharge orifice, a flexible tube attached to said thimble surrounding said opening and extending downwardly therefrom to a point adjacent the lower end of said body member and forming a downward extension of said opening, rigid means at the lower end of said tube preventing lateral collapse of said lower end of said tube, and devices engageable with the lower end of said tube effective to prevent longitudinal collapse of said tube; said tube being of a smaller diameter than the internal diameter of said body member and the annular space between said tube and the interior of said body member being sealed at the upper end thereof by said thimble with resultant formation of an air dome effective in the event of backflow conditions to cause lateral collapse of said tube at a point intermediate the ends thereof with resultant closure of the tube against backflow therethrough.

3. A toilet backflow preventing valve means comprising a vertically disposed, tubular body member having substantially the same internal diameter as the soil pipe, said member being positioned between and affording conduit connection means between the discharge orifice of a toilet and a soil pipe, airtight means extending across the upper end of said body member having an opening of substantially the same size as the discharge orifice of the toilet fixture positioned in substantial axial alignment with the orifice, a flexible tube having airtight connection with said airtight means extending from and forming a downward extension of said opening terminating adjacent the lower end of said body member, means on the exterior of the lower end of said tube effective to hold it open, and other means supported by said body member loosely encircling said lower end of said tube above said means holding said tube open and effective by engagement with said last named means to prevent longitudinal collapse of said tube; said tube being of less diameter than the internal diameter of said body member and combining therewith to form an annular air dome space effective upon the presence of backflow conditions to cause air trapped therein to be compressed with resultant lateral flattening of said tube intermediate its ends and resultant prevention of blackflow therethrough.

4. A valve means as claimed in claim 3 in which said means for holding the lower end of said tube open comprises a rigid ring element attached to and encircling the lower end of said tube and in which said means for preventing longitudinal collapse of said tube comprises a ring loosely encircling said tube and means extending downwardly along the exterior of said tube supporting said last named ring at a point slightly above said rigid ring element.

5. A valve means as claimed in claim 3 in which said airtight means comprises a thimble having a flange interposed in the joint between the toilet and the upper end of said body member; said thimble having a depending sleeve portion forming said opening, and in which the upper end of said tube is attached to said sleeve portion.

6. A valve means as claimed in claim 3 in which said airtight means comprises a thimble element having a flange interposed in the joint between the toilet and said body member and in which said thimble supports the upper ends of said flexible tube and of a second tube

closely fitting the internal face of said body member; the surface of said thimble between said tubes being imperforate and the connections of said tubes with said thimble being airtight with resultant formation of said annular airdome.

7. A valve means effective automatically to prevent the escape of backflow from a soil pipe connected receptor comprising a vertically disposed tubular body member having an internal diameter substantially equal to the internal diameter of a soil pipe and having its lower end connected to the soil pipe and its upper end connected to a receptor of fluid to be delivered to the soil pipe, airtight means sealing the upper end of said body member having an opening therethrough of substantially the same diameter as the discharge opening of the receptor means, a flexible tube disposed in said body member and extending parallel thereto having its upper end connected to said opening in said airtight sealing means and thence extending downward as an extension of the receptor discharge opening and said opening in said sealing means, meas attached to and holding the lower end of said tube open, and other means encircling said tube above the lower end thereof and engageable with said lower end effective to allow only limited longitudinal collapse of said tube; said tube being of less diameter than the internal diameter of said body member and the internal face of said body member, the external face of said tube and the air tight seal and joint at the upper ends thereof combining to form an annular air dome effective, upon the presence of backflow conditions, to cause air trapped therein to be compressed with resultant lateral flattening of said tube between its ends and consequent prevention of backflow therethrough.

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